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**TROUBLED WATERS: WATER AND THE ISREALI-
PALESTINIAN DILEMMA**

by

Brian Anthony Eberling, Major, USAF

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Advisor: Dr. Robert DiPrizio

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Contents

DISCLAIMER.....	iii
LIST OF APPENDICES.....	iv
ABSTRACT.....	v
SECTION 1: INTRODUCTION.....	1
SECTION 2: BACKGROUND/EVOLUTION OF MODERN DAY ISRAEL.....	2
SECTION 3: THE HYDROLOGICAL ENVIRONMENT.....	4
SECTION 4: INITIAL PEACE TALKS AND CONTROL OVER RESOURCES.....	7
SECTION 5: EARLY WATER LAWS.....	10
SECTION 6: MADRID, OSLO I AND OSLO II.....	12
SECTION 7: THE MOUNTAIN AQUIFER AND THE CURRENT SITUATION IN THE WESTBANK.....	15
SECTION 8: SOURCES OF CONFLICT.....	19
SECTION 9: ISRAELI CONCERNS.....	24
SECTION 10: RECOMMENDATIONS/CONCLUSION.....	26
BIBLIOGRAPHY.....	38

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List of Appendices

Appendix A. 1947 UNSCOP PARTITION PLAN

Appendix B. ISRAEL POST 1949

Appendix C. LAKE KINNERET / LAKE TIBERIAS AND THE GOLAN HEIGHTS

Appendix D. THE MOUNTAIN AQUIFER

Appendix E. WEST BANK AREAS OF CONTROL

Abstract

It has been more than 40 years since the Israelis first gained control of the West Bank and Gaza Strip. During those years numerous attempts have been made to develop an acceptable solution to the Israeli-Palestinian Conflict, one which grants the Palestinians a sovereign homeland and offers reasonable assurance of Israeli security. The past 20 years have seen progress towards Palestinian autonomy, most visibly the handing over of the Gaza Strip to Palestinian control, however Israel has continued to maintain a tight rein on the West Bank. Images of terrorist bombings and tires burning in the streets dominate media coverage along with storylines explaining the security reasons for maintaining control over the West Bank. There is, however, a more basic element complicating the issue of an Israeli withdrawal and achieving a two-state solution, an element that does not receive flashy media attention but lies at the core of the conflict nearly as much as guaranteeing security. That complicating element is control over water.

Israel receives nearly 100 percent of its consumable water from only three primary sources in the region: Lake Kinneret, the Coastal Aquifer, and the Mountain Aquifer. The issue complicating a Palestinian-Israeli two state solution is that the Mountain Aquifer, the most pristine water source of the three, lies primarily under the West Bank. Israel currently receives more than 30 percent of its freshwater from the Mountain Aquifer which it would have to share with any new Palestinian state.

This research project explores the importance of control of the Mountain Aquifer to Israel, its relationship to control of the West Bank, and the impact of current Israeli water control practices on Palestinian development.

Introduction

Since its inception, the state of Israel has been in a state of conflict. It has fought wars of survival with Arab neighbors and battled Palestinian groups seeking the creation of a Palestinian homeland. For the past two decades the Israelis and the Palestinians have met numerous times trying to develop an acceptable two-state solution – the creation of a Palestinian state in what is currently the occupied West Bank and Gaza. Of the many issues that have been difficult to resolve, one of the most difficult that does not receive much international attention has been control over shared water resources. In arid regions like the Middle East, control over the few available water resources is a matter of maintaining state sovereignty. If a country does not have access to adequate water, it will not be able to sustain its population or continue to develop both industrially and agriculturally.

Israel obtains its freshwater largely from three sources in the region, one of them being an aquifer originating from under the occupied West Bank. This subterranean aquifer would have to be the primary source of water for any new Palestinian state. The issue arises that over the past 40 years, Israel has become ever more dependent on this water source to provide its national water supply and it perceives that maintaining control over the aquifer is critical to national security. To protect its interests, Israel has enforced aggressive water management policies in the West Bank and has been hesitant in relinquishing control. Palestinians state that the administration policies are discriminatory, exploitive, and are aimed at hindering Palestinian development. Furthermore, the larger question remains, is Israel's dependence on the aquifer at such a level that it is hindering reaching an acceptable two-state solution?

Background / Evolution of Modern Day Israel

The modern state of Israel has its roots in the 1947 mandate put forth by the United Nations Special Committee On Palestine (UNSCOP). UNSCOP recommended that British governance of the area end May 15, 1947 and that the land referred to as Palestine be partitioned into two separate Arab and Jewish states (Appendix A).¹ Areas that were of historical importance to both groups, such as Jerusalem and Bethlehem, were to be included in an international zone. At the time there were approximately 1.2 million Arabs and 600,000 Jews living in the area of interest.² The proposed area given to the Jews was designed to allow the retention of industrial areas in the north already established by Jewish settlers, and allocated land in the Negev for future immigrants to the Jewish state. The mandate passed the UN General Assembly with a two thirds vote backed by both the United States and the Soviet Union.

The announcement of the UN mandate's approval was met with joy on behalf of the Jews, despair by the Palestinians, and by immediate preparations for war by the Arab nations in the Middle East. Jewish leaders such as Ben-Gurion seized the initiative and hurriedly began to develop a government that would stand-up on the day the British mandate ended.

For the Arabs and the Palestinians, the partitioning of what was the land of Palestine was unacceptable and plans were made to halt any establishment of a Jewish nation. The Arab nations, led by Abdul Nassar and his Pan-Arabism ideology, sought to be the defenders of the Palestinians and deny the establishment of a Jewish state.

When the British mandate officially ended on 15 May 1947, Ben-Gurion announced the independence of the Jewish state of Israel and on the following day the Arab militaries of Syria, Jordan, Iraq, and Egypt attacked. The Arab nations were disjointed in their efforts against an Israeli force that despite its recent establishment as a nation exceeded Arab soldiers in terms of

training and commitment.³ The lack of unity of effort by the Arab forces allowed the Israeli military to repel their attacks and when the final fighting ceased the political landscape had changed (Appendix B).

After the truce in what Israel calls its battle for independence, Israel found itself occupying much more land than had been established by the UNSCOP mandate. The only areas outside of its control were where Egyptian forces occupied a small piece of land on the coast, referred to in this paper as the Gaza strip and in the east where Jordanian forces had been able to occupy the area sometimes called Judea and Samaria, referred to in this paper as the West Bank.

The next major war which was to shape Israel's borders was the Six Day War of 1967 which was fought between Israel and the Arab nations of Syria, Jordan, Egypt, and Iraq. Increasing tensions between Israel and its Arab neighbors over the previous decade finally culminated in Egypt's blockade of the Strait of Tiran, Israel's only access to the Red Sea. On the morning of the fifth of June, Israeli forces launched a pre-emptive attack on Egyptian forces on the Sinai Peninsula effectively eliminating the Egyptian Air Force as a combat force. Israeli ground forces attacked and defeated the Egyptian forces on the peninsula by the eighth of June. Jordanian forces to Israel's east hesitated in their attack and subsequently fell back to positions east of the Jordan River allowing Israeli ground forces to occupy the entirety of the West Bank. Israel's battle with Syria focused on capturing the Golan Heights. Syrian positions in the Golan Heights had been a thorn in the side of Israel's security concerns since Israel gained independence. The Golan Heights overlooked many Israeli populous areas on the plains below and therefore held strategic value. What was also recognized by Israel was that the capture of the Golan Heights in the north would bring Lake Kinneret, sometimes referred to as Lake Tiberius, and a portion of its headwaters entirely under Israeli control (Appendix C).

The Six Day War ended with a ceasefire on 11 June 1967. The war had resulted in an overwhelming victory for Israel which had nearly tripled area under its control. Areas under Israeli control now included the Sinai Peninsula, the Gaza Strip, the West Bank (including East Jerusalem), and the Golan Heights. These areas, excluding the Sinai Peninsula which would return to Egypt in 1979 and the Gaza Strip which Israel officially handed over to the Palestinian Authority in 1994, continue to define the area controlled by Israel to the present day.

The Hydrological Environment

Situated in the eastern Mediterranean, the climate of Israel is relatively dry ranging from semi-arid to arid. Rainfall is most plentiful in the north averaging 1000 mm per year in contrast to the south Negev desert region which averages only 25 mm per year.⁴ Natural water sources in the region consist of surface and subsurface sources.

Surface water sources are comprised of lakes, rivers, and natural springs. Lakes and rivers in the region are recharged by storm water runoff or by base flow. Storm water runoff results from the diversion of rainfall into streams which feed rivers and lakes. This source of replenishment is highly variable depending on frequency, magnitude, and distribution of the rainfall.⁵ Base flow consists of the water that discharges from naturally occurring springs. This source of replenishment is called a “fair weather” source and accounts for nearly all the flow during the dry season. The majority of springs that provide water year round are located in the north where the water table is high enough to allow for the water to reach the surface. Springs are dependent on the water table being close enough to the surface so that water pressure is sufficient to force the water up to the surface. This makes springs susceptible to the effects of over-pumping by wells which lowers the water table preventing water from reaching the surface.

Subsurface water sources in the region are comprised of aquifers. Aquifers are naturally occurring subsurface structures consisting of permeable rock formations that capture and hold water stemming primarily from rainfall or streams. The permeability of the rock structure, primarily sandstone, dolomite, and basalt, allows for the natural underground capture and storage of water.⁶ The water in an aquifer generally flows from higher to lower areas unless obstructed by a non-permeable rock structure and can be accessed for human use through the digging of wells. During periods of recharge, in areas where the water table is close enough to the surface, some of the water will reach the surface creating a spring.

Aquifers in the area are susceptible to the effects of over-pumping and pollution. Over-pumping lowers the water table leading to the depletion of water accessible by shallower wells or through springs. This leads to the digging of deeper wells by those who have the means which coupled with periods of below normal recharge serves to exacerbate the problem. The natural characteristics of an aquifer allow it to be susceptible to contamination. Contamination of an aquifer primarily occurs either through polluted surface water percolating down through the permeable layers or through salinization. Salinization happens when salt content of neighboring subsurface water is allowed to flow into the area normally filled by fresh water. This occurs due to the decrease in water pressure being exerted outwards as the freshwater in the aquifer is being depleted.

Israel's primary water sources are Lake Kinneret, the Mountain Aquifer, and the Coastal Aquifer which together make up what is referred to as Israel's national water system (NWS). The combined components of the water system provide Israel with the majority of its fresh water requirements for domestic, agricultural, and industrial purposes which amounts to approximately

1,800 Million Cubic Meters (MCM) annually which according to some experts is currently 95 percent of the usable amount.⁷

Lake Kinneret, also called the Sea of Galilee or Lake Tiberias, is the country's most significant freshwater source, and in recent years has provided over 50 percent of domestic water demand. Its water replenishment sources are comprised of rainwater, natural springs, and small rivers that flow in from Lebanon and the Golan Heights. Due to the dependent nature of these feeder sources on rainfall, the amount of water that can be used from the lake differs from year to year. On average, Lake Kinneret receives an annual inflow of 800 MCM of which 280 MCM evaporates, 80 MCM is released to flow down the Jordan River to the Dead Sea, 70 MCM is used locally and the remainder is diverted to the Israeli National Water Carrier.⁸ In 1965, Israel constructed the National Water Carrier, a system of canals and pipes that siphon off approximately 370 MCMs during an average year of water from Lake Kinneret.⁹ This water is diverted southwestward into Israel and down to more populated areas and eventually to the Negev desert for agricultural irrigation.

The Coastal Aquifer, which runs north-south along the Mediterranean coast, is the second major source of fresh water. Providing approximately 320 MCMs annually, the Coastal Aquifer provides 20 percent of Israel's freshwater and is shared with the Palestinians in the Gaza Strip which has been under the administration of the Palestinian since 1994. Of concern to the Israelis is the increasing salinization and pollution of the Coastal Aquifer which Israel blames on Palestinian mismanagement of the aquifer. The Coastal Aquifer has been experiencing increasing levels of salinity making the water brackish and unfit for certain uses. This increase in salinity is due to saltwater intrusion by the Mediterranean caused by falling water levels in the aquifer. The Israeli government blames the falling level of the aquifer on the large increase in

the number of wells in Gaza since the handover to Palestinian control. The pollution of the aquifer by industrial and human waste is tied to the lack of such controls in Gaza and also due to the nature of the aquifer itself, it being a shallow aquifer close to the surface.

The final primary source of Israeli freshwater with a sustainable annual yield of approximately 620 MCM, is the Mountain Aquifer.¹⁰ The Mountain Aquifer provides Israel with approximately 30 percent of its freshwater. With portions straddling the border between Israel and the West Bank, it is control of the water in this aquifer that is a primary source of contention between Israel and the formation of a future Palestinian state.

The Mountain Aquifer is actually a system of three aquifers, the Western Aquifer, the Northeastern Aquifer, and the Eastern Aquifer all recharged by rainfall falling in the hills of the West Bank (Appendix D). The water then flows from each separate aquifer from areas of recharge to areas of discharge. The subaquifers of the Mountain Aquifer flow east and west into underground geological reservoirs where the water is extracted primarily by wells. Of note, is that portions of the northern and western reservoir basins flow out from under the West Bank to areas that are under Israel proper. So while 80 to 90 percent of the recharge of the Mountain Aquifer occurs in the West Bank, the flow of the aquifer crosses geopolitical lines into Israel.

Early Peace Talks and Control Over Resources

To better understand the current political climate and how Israel rationalizes its occupation of the West Bank it is important to analyze the major peace talks that have occurred largely since the 1967 war ended.

In the months that followed the Six Day War the United Nations attempted to construct a plan for peace in the form of Resolution 242. Resolution 242 became the cornerstone for most future attempts at a peace plan calling for Israel to give up land occupied from the six day war in

exchange for peace agreements from the warring Arab states. A major point of contention that developed centered on the wording in the document and whether the intent was for Israel to vacate the occupied territory prior to any peace talks. The contention over the wording centered on the sentence “Withdrawal of Israel armed forces from territories occupied in the recent conflict.”¹¹ A key omission in the English version compared to other texts is the omission of the word ‘the’ before ‘territories occupied’. The omission inferred that the entirety of the occupied territories were not called upon to be relinquished, only portions. Indeed, this is the translation that Israel subscribed to.

The Israeli government defended their position that the document did not call for relinquishing the entirety of the land occupied in the war and that the occupied territories would not be relinquished in the current hostile situation. This position can clearly heard in rhetoric official proclamations such as Prime Minister Golda Meir’s announcement in 1969 that Israel would never consider giving up the areas gained. Retention of the Golan Heights and the West Bank specifically were rationalized as providing a needed security buffer against further aggression.¹² The Israelis also did not view compliance with the U.N. resolution as a precursor to negotiations in direct contrast with the Arab position.

The Arab leaders held to the document as it was translated in other languages, mainly French, where the word ‘the’ was included, and called for Israel to vacate and relinquish all occupied areas and return to its pre-1967 borders.¹³ The return to the pre-1967 war borders would continue to be one of the primary demands by all Palestinian negotiators.

In the eyes of the Palestinian Liberation Organization (PLO), which would become the primary proponents for a free Palestine, the defeat in the Six Day War destroyed the credibility of the Arab countries. Yasser Arafat took the opportunity to step out of the shadows of the Arab

League and declare the PLO as an independent organization working for the establishment of a Palestinian state with him as Chairman. In the view of the Palestinians, all future legitimate negotiations for an Israeli-Palestinian peace plan would have to include the PLO directly.

The remainder of the 1970s saw the continued evolution in political activity as Israel shifted from negotiating solely with regional Arab states to recognizing the legitimacy of the PLO as the central spokesmen concerning Israeli-Palestinian affairs. The PLO also began an important ideological shift away from more radical positions regarding Israel's right to exist towards the goal of accepting a two-state solution where a Palestinian state would be created from any territory that could be liberated from Israel (the West Bank and Gaza Strip).¹⁴

Israel's occupation and management of the territories gained in the 1967 war raised issues concerning international law as it applied to the situation. Debate primarily centered on the question of whether Israel's occupation of the areas fell under the purview of customary laws such as the law of belligerent occupation.

Customary law "consists of rules of law derived from the consistent conduct of States acting out of the belief that the law required them to act that way."¹⁵ Customary laws are recognized by the International Court and the United Nations as the primary sources of international law and are believed by the international community to be validated through common practice. The law of belligerent occupation, a subset of the larger field of humanitarian law, protects individuals in occupied territories by giving them special rights and protecting their land and natural resources from harmful exploitation. Significant to Israeli establishment of settlements and resource management practices in the West Bank, the law specifically restricts practices like establishing settlements and destroying property.¹⁶

The Israeli position was, and still is, that since the West Bank was not under the formal authority of a sovereign state the law of belligerent occupation does not apply. The West Bank was not officially part of Jordan thus the area “was not occupied by a sovereign power whose occupation enjoyed international recognition.”¹⁷ This means that Israel does not view international laws that prohibit settling an occupied territory with one’s own people or prohibiting the exploitation of the resources of an occupied state as applying to the West Bank. Indeed, soon after the Six Day War ended Israel started building settlements in the West Bank that were to be populated by Israeli citizens and immigrants and established certain governing laws.

The Palestinian view, as well as the majority of the international community, is to the contrary. Even though a sovereign was technically not ousted in the war, the West Bank is now occupied territory and as such the law is applicable and should be complied with. By ignoring the law Israel is exploiting its position by allowing the influx of settlers altering the regions demographics and allowing construction projects detrimental to the indigenous population.¹⁸

The occupation of the lands gained in the 1967 war had a polarizing effect in Israeli politics as well. The nationalistic religious groups and secular nationalistic organizations vehemently called for the annexation of the occupied territories, versus a less vocal Movement for Peace and Security, whose position ran against postwar occupation and the “evil aspects of ruling another nation.”¹⁹

EARLY WATER LAWS

Due to the fact that the state of Israel never officially annexed the occupied territories, the administration of Israeli law or unique laws specific to the West Bank fell to the Israeli Defense Force. Immediately after the occupation in 1967, Israel began issuing guidance concerning the

governance of the new territory. Regarding the administration of resources including water, Israeli officials released Proclamation No. 2. Proclamation No. 2 declared water resources in the region as Israeli state property and three subsequent military orders were released relating to controlling water use.²⁰

Military Order 92, *Concerning Jurisdiction over Water Regulations*, transferred all authority over water to an Israeli official appointed by the military commander. This official had sole authority to dissolve any existing water authorities and to appoint new members in the creation of new ones. This official also had control over production and supply of water, establishment of water projects including the drilling of wells, and control over fees and taxes.²¹

Military Order 158, *Concerning Jurisdiction over Water Regulations*, forbade the construction of any water installation, including wells, without a permit. The order gave the appointed Israeli official the power to deny or revoke any permit application at his discretion. Those structures dealing with water resources that did not have a permit would be confiscated by authorities.²²

Military Order 291, *Concerning Settlement of Disputes over Land and Water*, declared that all previous dispute settlements were null and void and any regulations and transactions, even if validated by civil court, could be cancelled.²³

The application of these orders effectively transferred the power that was formally held by the local authorities and village councils to the occupying force. Their effects served to hinder any Palestinian water development either at the water source or in infrastructure construction. Proof of the negative effects are evident in records showing that since the Israeli occupation not one permit has been granted for the drilling of new Palestinian controlled wells in the Western Aquifer²⁴ and that the Palestinian share of this most fruitful basin ranges only

between 3-7 per cent of total extraction.²⁵ The IDF would continue to be the sole authority in the West Bank for the next 25 years until the Oslo peace talks in the 1990s.

Madrid, Oslo I and Oslo II

In 1991, Israel agreed to meet for three days with a joint Jordanian-Palestinian delegation in Madrid, Spain. The Madrid talks were ground-breaking more for the fact that it was the first time that Israel had a meeting with representatives from the PLO and addressed the Palestinian problem than for any solid resolutions. The talks established an agreement for successive bilateral discussions between the two parties.

The most progressive of the sessions between Israel and the PLO took place in Oslo, Norway in 1993. The fruit of these meetings was the 1993 Declaration of Principles on Interim Self Government Arrangements signed by PLO Chairman Yasser Arafat and Israeli Prime Minister Yitzhak Rabin in Washington D.C. The Declaration of Principles (DOP) was ground-breaking in that the two parties finally formally recognized one another and also established for Palestinian free elections. The elections would choose a legislative council and elect a President of the national authority setting in place the foundations for a comprehensive peace.²⁶ The new Palestinian Authority (PA) was to administer the Gaza and West Bank territories and allow for a gradual transfer of power from Israel to the Palestinians starting with the pull-out of Israeli Defense Forces from parts of Gaza and the West Bank.

This transfer was envisioned to occur in several stages. Israel was to pull its forces out of Gaza and turn it over to the Palestinian Authority. Next, some civil authority was to be handed over to the PA. The PA was to have transferred to it authority over “education and culture, health, social welfare, taxation, and tourism.”²⁷ Third there was to be an Interim agreement on

implementation of the full DOP and lastly an agreement on the major issues of “Jerusalem, settlements, water, and refugees.”²⁸

Administration of water resources was relegated to Annex 3 of the declaration titled Economic Cooperation, which was to set the framework for the establishment of an Israeli-Palestinian Continuing Committee to focus on among other areas of economic import, water issues. Wording in the Annex called for the creation of a Water Development Program staffed by both Israeli and Palestinian experts, which would further develop the mode of cooperation in water management issues. The management issues would include the determination of water rights and the equitable utilization of shared water resources to be implemented during and after the interim transitional period.²⁹

The Palestinian Authority also formed a Palestinian Water Authority (PWA) which was charged with addressing all Palestinian water issues. The PWA met with limited success due to the fact that it could not meet its chartered goals without sovereign control over the water resources in the West Bank. Overall control of the West Bank still fell under the Israeli military which was not in agreement with many of the attempted PWA policies.³⁰

The 1993 Declaration of Principles was not planned to be the solution to the Palestinian dilemma but was only meant to be a first step, until further negotiations could develop a more substantive agreement. The organizations spawned from the Declaration suffered from the lack of authority to act on their intentions.

In 1995, Israel and the PA met again to further the formal talks between the two groups. The result of this session was the Interim Agreement on the West Bank and Gaza Strip (Oslo 2). Oslo 2 resulted in the expansion of the Palestinian authority in the West Bank. The agreement

had the West Bank divided into three areas, A, B, and C, along with differentiations in levels of Israeli/Palestinian control and authority (Appendix E).

Area A was comprised of six of the highly populated centers where the PA was to have full responsibility for internal affairs and security in matters concerning Palestinians. Area B was comprised of approximately 450 smaller towns where the PA would ensure public order and internal Palestinian security however Israel was still the final authority for security matters in general. Area C was to initially be fully under Israeli control until being turned over to the PA. The timing of the relinquishment of areas in Area C was left vague.³¹

Regarding control and administration of water resources, Article 40, Annex III established the basis for Israeli-Palestinian cooperation in water and sewage.³² Israeli negotiators for the first time formally recognized Palestinian water rights in the West Bank, much to the surprise of many in Israel. Even though this first ever ‘recognition of water rights’ was met by a fervent outcry of negative sentiment by the Israeli media, the actual ‘rights’ were extremely limited. The Agreement estimated future water needs of Palestinians in the West Bank to be between 70 and 80 MCM per year. Surprisingly, when broken down into per capita numbers this amounted to between 27.6 and 31.6 cubic meters annually, far below current per capita usage.³³ Experts have debated why the Palestinians would have agreed to such a low number. Many researchers are of the opinion that since the final amount of water to be allocated was actually to be set during future permanent status negotiations, the Palestinians agreed mainly to avoid a breakdown in the negotiation process and to give the appearance of progress.³⁴

To address the allocation of water resources a Joint Water Committee (JWC) was established “to be the main vehicle for water cooperation.”³⁵ The committee was to be made up of an equal number of Israeli and Palestinian representatives to implement the terms of the

agreement. Joint supervision and enforcement teams were to stem from the JWC to “monitor, supervise, enforce, and rectify problems arising from unauthorized well drilling and inappropriate water use.”³⁶ An administrative requirement that would prove to have critical implications was that a consensus vote by all members was required to approve and implement measures.

During the interim time period from 1995-1999 before the Al-Aqsa intifada in 2000, the Palestinian name for the revolt against Israeli occupation, there was a nominal transfer of water responsibilities to the areas controlled by the PA. There was, however, little change in the actual distribution of water due to the fact that the JWC proved to be ineffective. One of the main reasons cited for the ineffectiveness of the committee was due to the requirement for a consensus vote and thus Israel retained a “virtual veto power on the committee and was unwilling to fulfill agreed upon obligations.”³⁷ The charter establishing the JWC failed to include any procedures on how to progress when consensus was not reached, thus issues could not progress.

The second intifada, which began in 2000, has effectively ended any progress towards peace. While the JWC still exists and continues to attempt to address the water issues in the West Bank, the sustained violence and resurgent Israeli hard-line position has largely ended any bilateral progress. While the Israeli military did relinquish internal control over the Gaza Strip in 2005 to the Palestinians, Israeli control in the West Bank has remained relatively unchanged since Oslo 2.

The Mountain Aquifer and the Current Water Situation in the West Bank

Any future negotiations addressing the Israeli Palestinian dilemma will probably continue to center around a two state solution where a Palestinian state is created out of the West Bank and Gaza. Other than addressing security concerns, controlling the Gaza Strip held little

additional value for Israel. In contrast, controlling the West Bank affords Israel critical control over the Mountain Aquifer. The Mountain Aquifer has developed into an integral component in Israel's national water system supplying fully one third of Israel's freshwater supply. It is control and access to this aquifer that will play a central role in any future negotiations and where perceived discriminatory policies are already emerging as an inflammatory source of conflict.

The Mountain Aquifer is actually comprised of three sub-aquifers named according to the direction of the water flow away from the recharge zone: the Western Aquifer, the Northeastern Aquifer, and the Eastern Aquifer.

The Western Aquifer is the largest of the three sub-aquifers and flows westward from its recharge area in the West Bank mountains. Eighty percent of the Western Aquifer's recharge area lies in the West Bank while a large portion of its storage basin lies under Israeli controlled areas. In addition to its large sustainable yield of 380 MCM, the aquifer's water is important due to its high quality.³⁸ Ninety Five percent of the water goes to supply Israelis in Tel-Aviv and Jerusalem. The remaining five percent is allocated to Palestinians in the West Bank largely for agricultural purposes.³⁹

The Northeastern Aquifer flows north from out of the Samarian mountains and approximately 90 percent of the underground basin is located within the West Bank. The average annual recharge for the Northeaster Aquifer is 145 MCM, of which Israel uses approximately 70 percent, mostly for agricultural irrigation and some for settlements in the Jordan valley. The remaining 30 percent is used by the Palestinians, mostly for domestic consumption and irrigation.⁴⁰

The third sub-aquifer of the Mountain Aquifer is the Eastern Aquifer. The flow pattern of the Eastern Aquifer is from recharge areas on the eastern slopes of the West Bank mountains towards the Jordan River. Fully 98 percent of the recharge areas of the Eastern Aquifer lie inside the West Bank. The annual sustainable yield of the Eastern Aquifer was initially believed to be 170 MCM but subsequent exploration by Israeli researchers has assessed the true number to be closer to 100 MCM.⁴¹ The Eastern Aquifer is the least utilized of the three sub-aquifers due to the brackish quality of its water making it not suitable for drinking without going through a desalination process. Out of the total amount utilized, 37 percent goes to Israelis mostly in the Jordan Valley settlements and 63 percent is used by Palestinians throughout the West Bank.

Taken as a whole, Israel's usage of the Mountain Aquifer amounts to nearly 80 percent of the Mountain Aquifer's annual sustainable yield of 620 MCM.⁴²

Division/ Aquifer	Israel		Palestinian Authority	
	MCM	Percentage	MCM	Percentage
West	350	94	22	6
Northeastern	105	70	40	30
East	40	37	67	63
Total	495	79	134	21

Source: Interim Agreement, 1995, Annex 3, Schedule 10; Hydrology Service; West Bank Water Department.

While the Mountain Aquifer supplies 30 percent of Israel's water it is by far the primary available water source for West Bank Palestinians, supplying 86 percent of their water. The Jordan River, which forms the eastern border of the West Bank, is currently not a viable water source due to pollution and high salinity levels. These conditions have been exacerbated by decreases in amounts of water allowed to leave Lake Kinneret, the river's primary water source.

There are only two additional sources of water available to the Palestinians: collected rainfall and water purchased from water trucks. Collected rainfall is rainfall captured in cisterns and roof top containers and stored for later use. This method is only valid as a water source during the winter rainy season and provides up to seven MCM per year. The second source is from water supplied by privately owned tanker trucks which deliver water for sale.

The majority of Palestinians are connected to a water supply system that pipes ground water sourced from wells to Palestinian towns as well as Israeli settlements. The wells used for urban water consumption are owned and operated by several entities that sell the water.

The primary company that sells water to Palestinian areas is the Israeli Mekorot Water Company. The Mekorot Company procures water from wells located both inside Israel and inside the West Bank and transports it to those cities, towns, and villages that are connected to the water system. Those wells located inside Israel proper draw water from the Western Aquifer and provide approximately 27 MCM annually. Those inside the West Bank are located inside Israeli settlements primarily in the Jordan Valley and tap the Eastern Aquifer. These wells annually provide 40 MCM to Israeli settlements and approximately 7.6 MCM is sold to Palestinians.⁴³ Through these wells the Merkorot Company currently sells one third of the urban water consumed in the West Bank.

Another organization that provides an additional 25 percent of the water in the West Bank is the West Bank Water Department (WBWD) which operates 13 wells.⁴⁴ The WBWD is a department of the Palestinian Water Authority and is the Palestinian representative body to the JWC. The 13 wells that the WBWD operates are controlled by the Israeli Civil Administration and the Mekorot Company which dictate the quantity and division of the extracted water.

Through these two organizations, in 2000 the Palestinians directly or indirectly purchased more than 55 percent of their urban freshwater from the Merkorot Company.⁴⁵

The remainder of the water is provided by several other organizations: Municipal water departments, independent public bodies such as the Jerusalem Water Undertaking, and the Palestinian Water Authority “which owns some of the new wells which were allowed to be drilled pursuant to the 1995 Interim Agreement”⁴⁶

SOURCES OF CONFLICT

Natural population growth in the area and increases in Israeli settlements in the West Bank, have resulted in even more pressure being placed on the Mountain Aquifer’s supply. There are currently more than 2.1 million Palestinians living in the West Bank. Over the last two decades the Palestinian population has experienced a large growth rate fueled by a very high fertility rate of 5.6 children per woman in the West Bank. From 1995 through 2002 the population in the West Bank grew by 32 percent from 1.63 million to 2.16 and this rapid growth rate is not estimated to peak in the near term.⁴⁷ This birth rate is among the highest in the world.

The population of Israeli settlements in the West Bank has continued to grow as well. In 2006 there were estimated to be more than 260,000 Israeli citizens living in 121 settlements throughout the West Bank.⁴⁸

The increased demand on the Mountain Aquifer has led to tighter control over access to the aquifer’s water by Israelis and to what Palestinians feel are discriminatory practices. The JWC, per the Interim Agreement, remains the primary governing body for water management policies throughout the West Bank. The committee has largely been ineffective in altering the status quo concerning water distribution due to its bureaucratic design.

Since being established in 1995, the JWC has only approved the development of 17 new wells. Implementing any new decisions still requires a consensus vote and no method has ever been established to overcome disputes between Israeli and Palestinian members when a consensus cannot be reached. Additionally, the administrative process to seek approval for a project is extremely lengthy. For example, an application to dig a new or replacement well must go through an 18-step process gaining approval at each level to continue, with a single 'no' answer leading to rejection. The Palestinians feel that this arrangement effectively gives Israeli's veto power over any attempt to alter the status quo and continues to stifle Palestinian development. The entire process can take eight years or longer.⁴⁹ In July of 2000 there were 56 proposed developments going through the review process and as of July 2008 that number had grown to 145 Palestinian projects in one step or another of the JWC process awaiting approval.⁵⁰ Some of the projects have been trapped in the process for more than 10 years.⁵¹ These include projects to build new pipelines connecting communities to the water network, build cisterns for rainfall collection, and to repair older water networks.

Israeli influence over water extraction from the aquifers is not limited to its veto power over new projects on the JWC. If a project gains JWC approval but is situated or will traverse through Area C (the sector that falls totally under Israeli control as per the Interim Agreement) the Israeli Civil Administration High Planning Committee must also approve the project. Due to the geographic reality resulting from the Oslo 2 accords, nearly all projects calling for water to transit from one area to another involves movement through an area in Area C. A source of frustration for the Palestinians is that the Israeli Civil Administration often fails to give its permission and provides no explanation. Examples of the type and scale of projects that have been rejected by the Civil Administration were: "construction of a reservoir at Ras Jabareh

(Tulkarem District), laying a main line at 'Izbat Tabib (Qalqilya District), and construction of a reservoir at Bet Duqo (Ramallah District).”⁵²

The lack of development in water infrastructure has had several negative effects. Old and leaking pipes in some areas account for the loss of up to 39 percent of the water before it reaches the faucet.⁵³ This loss is not accounted for in the allocated amount which is measured at the pumping station. The lack of development has also left an estimated 10 to 15 percent of the Palestinian population on the West Bank unconnected from a water system.⁵⁴ This amounts to approximately 220, 000 people who must get their water from cisterns or purchase it from water trucks at elevated prices.

When a project is approved, the JWC or the Israeli Civil Administration has the authority to impose restrictions on the project. These can be in the form of imposing limits on the diameters of water pipes which decrease the amount of water pressure, regulating the quantity of water withdrawn from a well by requiring meters, or by establishing a maximum depth for new wells. This last example has several contentious effects.

By limiting Palestinian dug wells to 140 meters or less in depth while authorizing Israeli dug wells to go as deep as 800 meters, the Israelis maintain direct control over the aquifer.⁵⁵ During dry years, as the aquifer’s water level drops, the shallower Palestinian dug wells run out of water first. By forbidding deeper wells, Israeli access to water is assured. Also, deeper wells provide access to the more pristine, cleaner water that lies deeper in the aquifer since the upper levels of an aquifer are the first areas to be affected by contaminants such as salinity and pollution. The Palestinians contend that this process is intentionally discriminatory and forces them to purchase freshwater through more expensive means such as water trucks. The privately owned water trucks that sell water to villages operate largely free from regulations. The water

from these trucks can be of questionable quality sometimes collected from agricultural wells and springs which are more likely to be contaminated by pesticides and excrement. Water purchased from the trucks is also more expensive than water purchased through the water network, costing 15-30 shekels per cubic meter depending on location compared to 2.5 shekels per cubic meter through the water network.⁵⁶

It is not only through bureaucratic administrative policies that Israel controls Palestinian access to the water in the Mountain Aquifer. Israeli authority over the wells and large portions of the water distribution network allow the national water company, Mekorot, to control the amount of water supplied to specific areas. This becomes a major point of contention especially during the dry summer months when active water regulation becomes more prevalent. Supply to Israel proper and Israeli settlements in the West Bank have the highest priority on water often at the detriment of water supplied to Palestinian villages. Many cities such as Bethlehem, Hebron, and Jenin, with a combined population of over 300,000, experience water rotation programs.⁵⁷ Under water rotation, water is supplied to a neighborhood of homes for a few hours during the day and then cut-off, it is then supplied to another neighborhood for a few hours, and the process continues. Palestinians feel this process is discriminatory due to the fact that the water supplied to the settlements in the West Bank is not regulated in this manner. Indeed, it has been documented by numerous sources that “estimates of per capita consumption in the settlements can reach seven-fold” the Palestinian consumption.⁵⁸ Another method that Israeli authorities use to control the amount of water being supplied to Palestinian recipients is through valves placed in network pipes that also serve the Israeli settlements directly. These valves are manipulated to decrease the water pressure to Palestinian areas as to preserve the water pressure in the settlements.⁵⁹ Lastly, water used by settlers is largely subsidized by the state ensuring an

inexpensive water supply. In contrast, the Palestinians receive no such subsidy and by some calculations a large percentage of the population spends nearly 10 percent of their daily wages on water. In a 1990 study it was assessed that a Palestinian paid nearly six times more for water than an Israeli settler.⁶⁰

As a result of not only the stringent control efforts by the Israelis but also the inefficiencies of a decaying water infrastructure, Palestinians rank amongst the lowest in the world in terms of domestic water consumption per person.⁶¹ Per capita, the average Palestinian uses 22 cubic meters per year, about 60 liters per day. This is well below the World Health Organization recommended minimum of 100 liters per day. By comparison, an Israeli citizen uses four and a half times more water, an estimated 104 cubic meters per year, or about 285 liters per day.⁶² The exact per capita water usage in the Israeli settlements in the West Bank is not officially available due to the reporting method used by the Israeli Central Bureau of Statistics. According to statements made by Israel's former Water Commissioner, Meir Ben-Meir, the estimated consumption of all of the settlements was approximately 16.7 MCM per year. Broken down into per capita numbers, that would amount to a daily consumption of 274 liters which would be more than four times the comparable Palestinian usage. Many independent researchers have estimated that the actual number is much higher.⁶³

The issues relayed above largely center around water for domestic use. The other facet to the Israeli-Palestinian water issue centers on water for agricultural purposes. This is especially relevant for the Palestinians whose current undeveloped economy is largely agriculturally based. Agriculture comprises approximately 7 percent of the GDP but just as important it constitutes the major source of Palestinian food products. Agricultural currently accounts for more than 60 percent of Palestinian water usage in the West Bank.⁶⁴ Wells used for agricultural purposes are

primarily privately owned by individual farmers or groups of farmers and are tightly regulated as well. These agricultural wells are required to be fit with meters to monitor amounts of water extracted. Water allocation for Palestinian agriculture has remained frozen at the level established in 1968, roughly 100 MCM annually.⁶⁵ To ensure that the allocation limits are not exceeded, in addition to installing the water meters, since 1967 no new licenses for agricultural wells have been issued.⁶⁶ Meanwhile, records show that Mekorot drilled 36 new wells for domestic and agricultural needs of Israeli settlements from 1967-1989. Twenty of the new wells were in the Jordan Valley tapping into the Eastern Aquifer, the main remaining water source for the Palestinians.⁶⁷

ISRAELI CONCERNS

Israel is aware of the negative sentiments of the Palestinians regarding the lack of control over water resources. Israel views control over the aquifer as necessary on many levels, for the good of the country and also for the good of the aquifer itself.

With a population of over six million people living in an arid environment, access to clean water is essential to the state's viability. Even at existing population levels and per capita consumption levels, nearly the entire allowable output of the National Water System is required to satisfy current demand. The long term management of the National Water System and of its three main sources, Lake Kinneret, the Coastal Aquifer, and the Mountain Aquifer, is deemed as "essential not only for Israel's future development but for her very survival."⁶⁸ Israel has watched with rising concern the gradual deterioration of water quantity and quality of its water sources.

Lake Kinneret has experienced both decreasing levels due to drought conditions and increasing pollution. The quality of the water has been affected by chemical and biological

pollutants to the extent that special treatment is now required before the water is allowed into municipal systems.⁶⁹

The Coastal Aquifer which Israel shares with Gaza has experienced perhaps the most alarming degradation of the three. Excessive extraction has led to alarming deterioration of both quantity and quality of the water. Naturally a source of brackish water, falling water levels in the aquifer has allowed for salt water from the Mediterranean Sea to infiltrate the aquifer increasing its salinity. The lack of allowable recharge which serves as a natural cleansing mechanism has also lead to pollution of the water as well. Israel points to the return of Gaza to Palestinian control as a case study of the dangers of sharing control over major water sources. Israel cites that after control of the Gaza Strip was returned there was a large jump in unauthorized well drilling. This accelerated the contamination of the aquifer and caused Israelis to question Palestinian competence and commitment to sustainable water management. When Palestinians vocally blamed the deterioration of the aquifer on Israel, which is only marginally connected to its groundwater, it seemed especially disingenuous.”⁷⁰

The former Israeli Water Commissioner, Menachem Kantor, pointed out that diminishing quantities or quality of any one source in the system only increases the importance of the other sources. He went on to state that effective management of the system is only possible if “control and authority” over the other sources are maintained, otherwise altering extraction rates cannot be guaranteed.⁷¹ It is these sentiments which drive the Israeli view that it is absolutely essential to maintain tight control over the Mountain Aquifer. The Mountain Aquifer is recognized as the “most important long-term source in the National Water System” due to its superior water quality and role as a “seasonal regulatory reservoir”, it is critical to the security of the nation.⁷² Whoever has control over the Mountain Aquifer has control over Israel’s primary fresh water

source. Additionally, Israel's well-being lies not only with controlling the amount of water extracted but also in ensuring the high quality of the water.

The vulnerability of the Mountain Aquifer to the same actions which are ruining the Coastal Aquifer is a scary proposition for Israel. Israeli studies have stated that it is physically possible to pump the aquifer in the West Bank at such a rate as to halt pumping operations inside of Israel.⁷³ Newspapers such as Ha'aretz and Ma'ariv reported that in 1996 that the Palestinians had initiated numerous illegal well digging operations in areas recently vacated by the Israeli Army serving as proof to Israelis of the necessity to maintain control in the West Bank.

Another concern stems from the vulnerability to the effects of unregulated human and industrial pollution in the West Bank. The majority of the Palestinian towns in the West Bank are not connected to a sewage system. Raw sewage flows into wadis and infiltrates the ground polluting the ground water below. Adding to the current level of concern over this issue, the PA has stated that when Israel totally vacates the West Bank they would settle the masses of expected returning refugees into these areas. Israel is concerned that the rise in pollution would irreparably harm the aquifer.

RECOMMENDATIONS/CONCLUSION

The current situation presents itself as a major obstacle in obtaining an acceptable two-state solution to the Israeli-Palestinian dilemma. The Mountain Aquifer, nearly 100 percent exploited, lies central to the tug-of-war struggle to finding a solution. Two groups of people are dependent on the same source of water and control over this resource is central to any resolution.

Israeli dependence on the fresh water from the Mountain Aquifer has developed so that it is now supplying one third of its freshwater. The deterioration of the Coastal Aquifer and to a lesser extent Lake Kinneret have made the Mountain Aquifer an even more critical component of

the National Water System and as evidence of what will happen if Israel ever were to turn over more authority, Israel points to the rapid deterioration of the Coastal Aquifer. To many Israelis this serves as evidence that the Palestinians cannot and will not adequately manage the aquifer and Israel cannot afford to let them ruin it.

The Palestinians contend that they are the victims of discriminatory practices and that any new Palestinian state will require more water than the 20 percent of the aquifer's yield they are currently allocated. They point to current Israeli practices as being discriminatory and aimed at preventing Palestinian development at the benefit of Israel. Palestinians currently receive only 60 percent of the WHO's recommended water amount for urban consumption and experience frequent periods of no water service. This would not be acceptable in a new nation trying to develop especially when its neighbors are not limited to such hardship. The water infrastructure in some areas has been allowed to deteriorate to where nearly 40 percent of the water is lost to leaks. These situations, the Palestinians feel, are due to the make-up of current administrative organizations that favor the Israelis and the maintenance of the status quo.

Any hope at a achieving a two-state solution will have to address all of these concerns. The root cause for many of them is the fact that the Mountain Aquifer is already nearly 100 percent utilized and is a primary source of water for both parties. Finding ways to increase the amounts of usable water will be critical in freeing up some of the aquifer's water and allow Israel to relinquish some control.

Since the aquifer is already nearly fully utilized Israel will have to seek alternative sources of usable water to make up for the share it would lose. Palestine would also not be left with an abundance of water and thus would have to seek for alternative water sources. Given the area's dependence on precipitation, any solution will most likely include the long-term

development of external water sources and/or creative reclamation and reuse of wastewater. Several proposed methods to a solution have already captured the media's attention.

One of the proposed solutions has Israel importing water from more water rich areas such as Turkey or the Balkan regions. Shipment would be through a pipeline (from Turkey) or in giant bladders shipped on barges. The bladders, called Medusa bags, are reported to hold up to 1MCM. The negative issues regarding external sourcing of water from these solutions is the risk incurred by dependence on external politics. A pipeline from Turkey would have to travel through historically unfriendly nations such as Syria or Lebanon not to mention the fact that Turkey is a Muslim nation that in the future may become hostile to Israel. The same issue is faced with the shipment of water in bladders. The Balkans has had a history of political instability and the dangers of having a sizable freshwater source be cutoff would be unacceptable. Additionally, considerable infrastructure investment would be required at both the exporting and importing sources. Estimates are that a period of operation of over 20 years would have to be ensured to achieve economic feasibility.⁷⁴

The construction of seawater desalination plants have been proposed as another source of water, especially by Israel as a source of water for the Palestinians. The problem with this idea is primarily economic. Not only is there sizable cost associated with the construction of the facility and transportation network, the cost to desalinate water is currently expensive. The cost to produce freshwater ranges upward from \$1.00 per cubic meter.⁷⁵ This cost is just production cost and does not include the additional costs incurred from the transport of the water.

More reasonable sources of additional water for Israel and Palestine will most likely come from more stable and cost effective measures. These include wastewater reclamation and the use/treatment of brackish water.

Wastewater reclamation affords the ability to reuse water effectively increasing the available supply of water. Israel is already a world leader in wastewater reclamation currently recycling about 70 percent from municipal treatment plants.⁷⁶ Recycled wastewater can be used directly in urban environments for things such as toilets, garden irrigation, household cleaning, etc, but most of it is currently diverted to the agricultural sector. Water for agricultural use does not have to be of as high a quality as domestic water; this allows fresher water to be diverted to homes. Currently the lack of investment in the West Bank has resulted in no wastewater facilities being constructed and thus this is an untapped resource.

Brackish water is water of marginal quality that may be unfit as drinking water but could be substituted in activities that currently use potable water. Usage for brackish water is similar to reclaimed wastewater except brackish water may be used untreated as irrigation for crops more tolerant of salinity. Brackish water is also less expensive to bring to potable water status than seawater desalination. Several small brackish water treatment plants are currently in operation in Israel and Gaza refining the process trying to bring down the cost even further.⁷⁷

An inexpensive and already used method that could be expanded is water harvesting through the use of cisterns or storage tanks. Thirty seven percent of the West Bank population currently uses this method to satisfy their basic water needs.⁷⁸ Their usage could be expanded to supply even more water relieving the pressure on the water distribution system. Urban development can be used to divert surface runoff or water from rooftop catchments to centralized containment basins. New and evolving technologies exist to protect and improve the quality of the stored water. Additional water sourcing does not have to be expensive, but it will be critical to the final peace process.

Any hope at arriving at a settlement will have to address measures that allow the Palestinians access to more water but also maintain the Israeli supply of freshwater. The alternative water sources identified above, and those yet to be identified, would effectively increase the amount of usable water available and decrease Israeli dependence on so much of the Mountain Aquifer. The new Palestinian state will have to be provided a more equitable share of the Mountain Aquifer along with levels of control commensurate of a sovereign nation. An acceptable two –state solution will have to include administrative oversight of West Bank water policies by a third party, perhaps the UN. This will be required to ensure that the aquifer is managed effectively and equitably by both parties. Extensive education will have to be provided to the Palestinians regarding water shed management as the long-term status of the Mountain Aquifer is in their interest as well. Additionally, infrastructure development would have to be paid for by the world community as the new Palestinian state would not be able to pay for the numerous projects required after years of neglect.

These are all details that will have to be addressed through negotiations but there is no doubt that if there is to be a successful outcome they will have to be addressed aggressively. The longer the status quo goes unchanged the more dependent Israel will become on controlling the Mountain Aquifer and the more discontent will grow among the Palestinians.

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Appendix A
1947 UNSCOP Partition Plan



Appendix B
Israel Post 1949



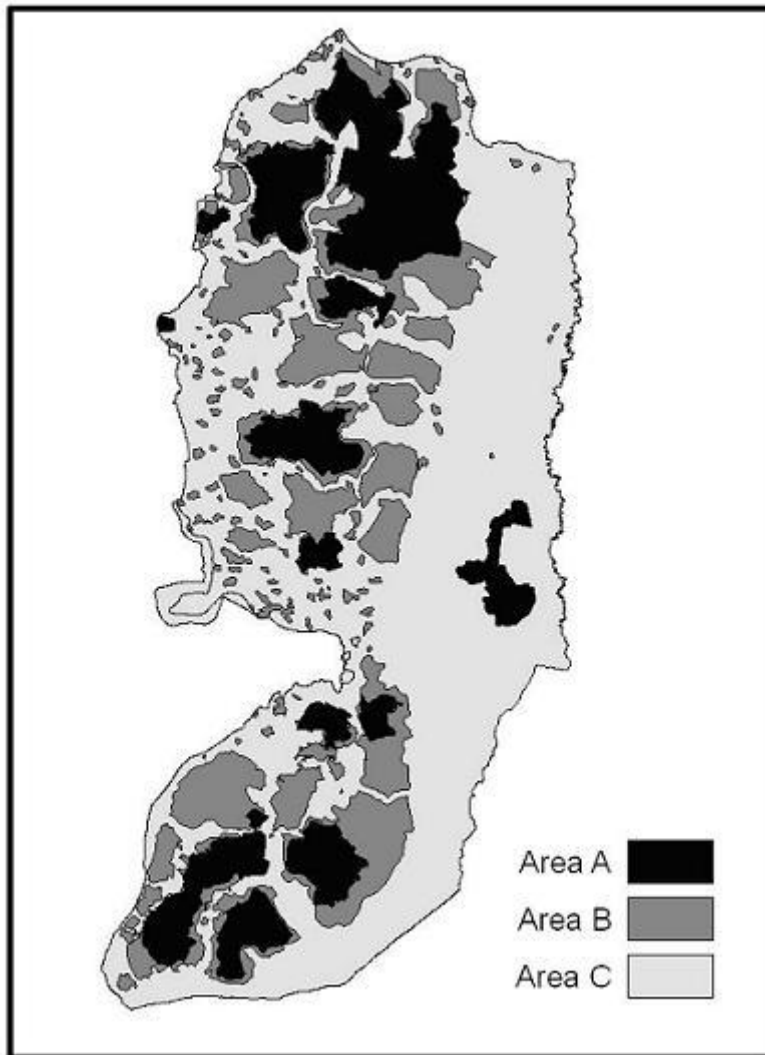
Appendix C
Lake Kinneret / Lake Tiberias and the Golan Heights



Appendix D The Mountain Aquifer



Appendix E
West Bank Areas of Control



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